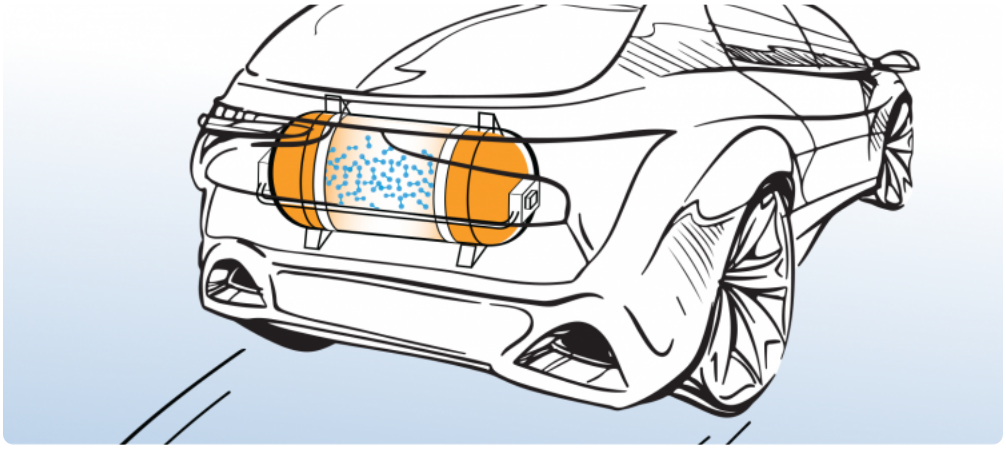

October 2019

FEATURE

Fuel's Errand?

Hydrogen fuel-cell vehicle adoption has slowed, with a refueling infrastructure limited to the coasts. Will retailer investment pay off?

BY JERRY SOVERINSKY

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Offering perhaps an unintended endorsement, Tesla co-founder and CEO Elon Musk disparaged hydrogen fuel cells earlier this year as "fool cells" and "mind-boggling stupid," a rancorous piling on that surely must point to signs that the eco-friendly technology is on to something.

Don't get us wrong. With fewer than 8,000 hydrogen fuel-cell vehicles (HFCFs) on the roads in the United States—the world's largest HFCV market—the technology is hardly on pace to replace internal combustion engine vehicles (ICEVs) any time soon. Or battery electric vehicles (BEVs), which number roughly one million since the Tesla Roadster debuted a little more than a decade ago.

But with zero impact on the electric grid, zero emissions, a charge time of three to five minutes and a minimum driving range of 300 miles on a full charge, BEVs offer dynamics that are favorable for convenience store owners, who no doubt grit their teeth every time they pass a big box store parking lot with its section of BEV charging stations.

The movement toward reduced emissions is undeterred, with BMW, Ford, Honda, Mercedes-Benz and Volkswagen agreeing to adhere to increased carbon emission standards, despite a White House plan to freeze CO_2 and mileage efficiency rules passed during the Obama Administration. Moreover, many have already committed to developing HFCVs and BEVs.

Nevertheless, this is not a sky-is-falling ad monition. Just an update of where the hydrogen market stands and how you can leverage, if at all, emerging opportunities.

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"In a world where governments are pushing for zero emission vehicles, if hydrogen fuel-cell vehicles gain traction, consumers can't fill them up at home, so that's an opportunity for retailers to capture the market," said John Eichberger, executive director of the Fuels Institute, in laying out succinctly the business value proposition for retailers.

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But the revenue prospects have eased from just a few years ago, Eichberger said, when there was a relatively aggressive national coordinated effort to roll out infrastructure. It seems like this momentum has slowed down.

Part of the reason, he said, is that electric vehicle technology has improved. "When the fuel cell came out, the talk was that it was easier. But now [BEVs] are producing a 300-mile range and can recharge quicker than just a few years ago."

The BEV advantages dissipate when the vehicle size increases, as the weight of a battery to support those vehicles becomes limiting. "The greatest potential for fuel cells is with large SUVs and commercial vehicles," Eichberger said, pointing to Anheuser-Busch's purchase of 800 fuel-cell trucks last year, with the truck's manufacturer, Nikola, promising to build 28 fueling stations along Anheuser-Busch's travel routes. "Once fully implemented, the carbon reductions gained from these 800 trucks will reduce the brewer's carbon emissions from logistics by more than 18%—equivalent to taking more than 13,000 passenger vehicles off the road annually," Anheuser-Busch said in a press release announcing the purchase commitment.

A DEVELOPING INFRASTRUCTURE

One of the primary companies helping to develop a hydrogen infrastructure is First Element, which operates 19 of the 39 hydrogen stations in California (and 12 of the 20 under development), the majority clustered in northern and southern California. "We partner with [station] owners to add hydrogen at their existing site. We operate it as an ancillary business. It's a separate revenue stream that we can bring to the station owner," said Shane Stephens, founder and CDO of First Element.

For now, First Element has focused on the California market, with the first station coming online in 2016. "We've had a successful initial launch ... and we've been trying to build on our learnings," said Stephens. In just a few years, the company has been able to downsize its equipment, which allows for easier installs and integrations with existing stations. "That's much better for the operator, and it makes a better proposition to take on," he said.

The process comes at a cost: as much as $4 million all-in, according to Stephens, money that First Element assumes, paying the station owners to lease their sites. "We take on all of the risks and handle everything—installation, permitting, maintenance and operation. It doesn't cost the owner anything ... it makes it a nice model for them to 'put their toe in the water.'"

Stephens calls this model a "natural alliance" for gas station owners, with customers pulling up to a hydrogen dispenser much like they do at a gas dispenser. "Fill-up takes four minutes, and that leaves time for the person to go inside the store to get food and drinks. The behavior of the customer is identical," he said.

Contrast the process to charging a BEV. "Battery EVs allow for home charging; they don't need to utilize external fueling," said Edmond Young, corporate strategy & planning, hydrogen infrastructure, for Toyota Motor North America. "As a result, these folks may never use a fueling station."

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GENERATING MOMENTUM

What's driving the push toward zero emission vehicles? "California adopted a zero-emission mandate nearly 20 years ago," said Edmond Young, corporate strategy & planning, hydrogen infrastructure, for Toyota Motor North America. Since then, Oregon, Maine, Colorado, Massachusetts, Vermont, Rhode Island, New York, New Jersey and Maryland have signed on. Based on the requirements, he estimates that by 2025, "about 8% of new vehicle sales in these states will be zero emission."

CALIFORNIA TAKES THE LEAD

In 2003, President George W. Bush kick-started U.S. investment in hydrogen fuel technology, offering $1.2 billion toward research funding. That came more than four years after the California Air Resources Board and California Energy Commission, along with automakers and oil companies, formed the California Fuel Cell Partnership (CaFCP), a coordinated effort "to demonstrate and promote the potential for electric vehicles powered by hydrogen fuel cells." Since then, California has taken the lead among states in advancing the commercialization efforts of hydrogen fuel cells, committing to 100 hydrogen stations and providing generous credits for those who invest in the technology.

Since 2000, California-based Frontier Energy has provided staffing and management for CaFCP, coordinating stakeholders, vehicle and station operators and regulatory agencies, while guiding creation of a roadmap for hydrogen's deployment. Like Stephens at First Element, Keith Malone, government relations lead at Frontier Energy, sees hydrogen as a natural fit for some gas station owners: "If you see the zero emission push as increasing, hydrogen for gas station owners offers them what some would call a transition: It's a business opportunity that matches their business [model]. For some, that's going to come sooner than later if you look at the West and East coasts and the higher density cities in the Midwest."

Malone is quick to emphasize that for retailers, it's not that hydrogen is the end-all solution to zero emission vehicles but an important component. "Both batteries and fuel-cell technologies offer advantages, and you'll need both … No government is saying that there's one true pathway. If you look at all automakers—except Tesla—most believe in both battery electric and hydrogen."

Young agreed, citing electrification as the macro trend. "The forecourt of the future will service battery electrical vehicles and fuel cells. It won't be 'either-or.'"

EYE ON THE PRIZE

Interest in hydrogen is building, Malone said, "and if I were a station owner in Las Vegas, I'd be keeping an eye on this." Moreover, he said that activity in the Pacific Northwest and Northeast also is strong. "They're building 12 stations in the New York-Boston corridor. You're definitely starting to see a percolation of interest."

As for the middle of the country, Malone said, "it's not very far off, but when I do national conferences, I triage people depending on their states," letting them know that stations are coming to the West and Northeast coasts, and that others will follow. "It will start in the heavy-duty sector," he said, "and then evolve to light duty."

That's not just a PR spin, but an assessment of the feedback that Malone is getting from retailers. "At first, many were skeptical. But as throughput has been declining with increased mileage, they're looking at other revenue generating means … Many have started to look at hydrogen stations."

Stephens said he's receiving similar feedback. "We used to have to call people to sell this, now we're the one getting the calls."

BUNDLE OF ENERGY

Whether hydrogen fuel succeeds as an alternative fuel depends on the commitment of energy providers. And Shell is playing an integral role in the development of a hydrogen infrastructure—both in the United States and abroad. "Shell is very active in the new energies transition; we're pursuing a portfolio of solutions in the new fuels division of new energies," said Oliver Bishop, general manager, Shell Hydrogen. "Not only hydrogen but battery as well as biofuels. Our approach is high level: to pursue all of the horses because customers want different things."

Shell and its partners have built more than 80 hydrogen refueling stations in Europe, with the majority (72) in Germany. In North America, it's focusing for the moment in California where it has nine hydrogen refueling stations. "We're also building three heavy-duty truck refueling stations for Class A big rigs in Los Angeles and Long Beach," Bishop said.

> "Fill-up takes four minutes, and that leaves time for the person to go inside the store to get food and drinks.

While the U.S. numbers are modest, Bishop said that's not a reflection of its commitment to hydrogen but to market realities: "The biggest problem is making sure that we align the number of vehicles that are coming to market with the number of stations." Additionally, hydrogen costs are currently double those of gasoline, which he attributed to economies of scale. "For hydrogen to be successful, it needs to be competitive … That will depend on the number of stations and vehicles." (A chicken-and-egg scenario, he added.)

Bishop said that while momentum is building among consumers for HFCVs, the biggest opportunities to-date are occurring with heavy-duty vehicles. "While the Tesla bubble is very strong, not everything can be solved with batteries. If you want to move 80,000 pounds, you can't do that practically with batteries."

Shell continues to invest its resources into developing a hydrogen refueling infrastructure, and it has reduced equipment costs by 50% in the past two years alone, which will encourage retailer investment. "Especially around airports and ports, [where heavy-duty vehicles abound], retailers in these vicinities will be well positioned to succeed," he said. "[Hydrogen] will help us get to zero emissions."

CASE STUDY

Varish Goyal, president of AU Energy, parent company of Loop Neighborhood Markets, offers hydrogen fuel at three of his company's stores, with plans to expand to another three. "We got into hydrogen because we feel that electric-charging vehicles will decrease the number of trips to our stores," he said. "So why not help an industry grow that requires some type of dispensing so that you retain the trips … It's a long-term play."

Working with Shell's hydrogen group, Goyal offers the fuel at two dispensers, with above-ground storage and a compression unit "taking up a decent amount of space on the property. In the next rollout, it will be smaller, though." While demand is modest—"We're doing about 24 cars per day on average," he said—his existing sites didn't require a reduction in the number of fuel dispensers, so there was no impact on traditional fuel transactions.

Goyal is pleased with his initial experience and offers a few key learnings to retailers exploring investment in hydrogen dispensers:

- "First, understand that installation will be more complicated than what is often presented," he said, "especially if you want to put the units in the canopy." Such an arrangement requires a longer fuel line, which can cause the hydrogen to not dispense at the correct pressure. "Make

sure that you're OK with the disruptions during construction, and negotiate compensation for it," he advised.

- Second, "The process has a lot of kinks to it ... like dispensers can't immediately fill one after the other. It takes a couple of minutes lag time, which is why we put in two [dispensers]."
- Third, "Don't worry about building the infrastructure yourself; work with companies that are already working with the states to build it. Charge rent, and let them operate things."
- Lastly, there's a labor component. "You'll need to educate your employees on the technology, because customers will hold everyone accountable, and they must know how to resolve situations."

BACK TO THE FUTURE

Whether an investment in hydrogen is right for your station, in the near term it depends on geography. "This could be a good business opportunity for you today; the revenue stream [from rents] is attractive and the owners we work with like the arrangement," Stephens said.

No matter where you're located, though, Stephens said that awareness will help you leverage any emerging opportunities. "The march to zero emissions is happening ... Over the next 10 years, we see a definitive pathway for hydrogen becoming a [strong] business model. Early adopters will be in good position to shape it and be its business leaders."

In the meantime, our analysis remains, more-or-less, the same: Great gas mileage. Simple to dispense. A minimal carbon footprint. The future of refueling?

To be continued ...

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ABOUT JERRY SOVERINSKY

Jerry Soverinsky is a Chicago-based freelance writer and a *NACS Magazine* contributing writer. Visit his work at www.jerrysoverinsky.com (https://www.jerrysoverinsky.com/).